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(71) Applicants
Ford Motor Company Limited,
(Great Britain),
Eagle Way,
Brentwood,
Essex.
(72) Inventors
Eugen Svab
(74) Agents
A. Messulam & Co.,
(Alec Moses Messulam),
24 Broadway,
Leigh on Sea,
Essex.

(54) **Planetary reversing gear**

(57) The invention relates to a planetary reversing gear for an infinitely variable traction-roller gear unit of a motor vehicle. The reversing gear serves to transmit torque from a drive shaft 1 to the primary shaft 2 of the traction-roller gear unit (not shown). The primary shaft 2 is a hollow shaft surrounding the drive shaft. The planetary reversing gear comprises a sun wheel 6 serving as output element, a ring gear 7 serving as a reaction element and a planet-wheel carrier 3 carrying two intermeshing planet-wheel sets 4, 5 which also mesh, respectively, with the sun wheel 3 and the ring gear 7. An axially slidable selector ring 9 is coupled for rotation with the ring gear 7 and is operative to interact by way respective synchronising clutches 13, 16 with gears 14, 17 arranged one each side of the ring gear 7, the gears 14, 17 being coupled, respectively, to a stationary housing 12 and to the planet-wheel carrier 3.

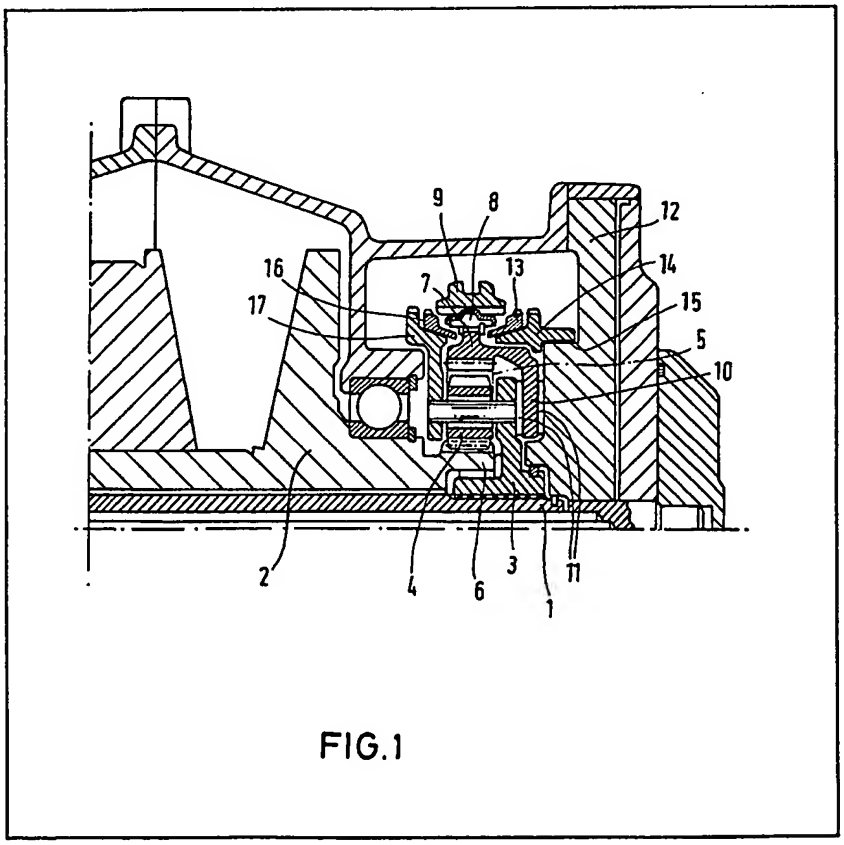

FIG.1

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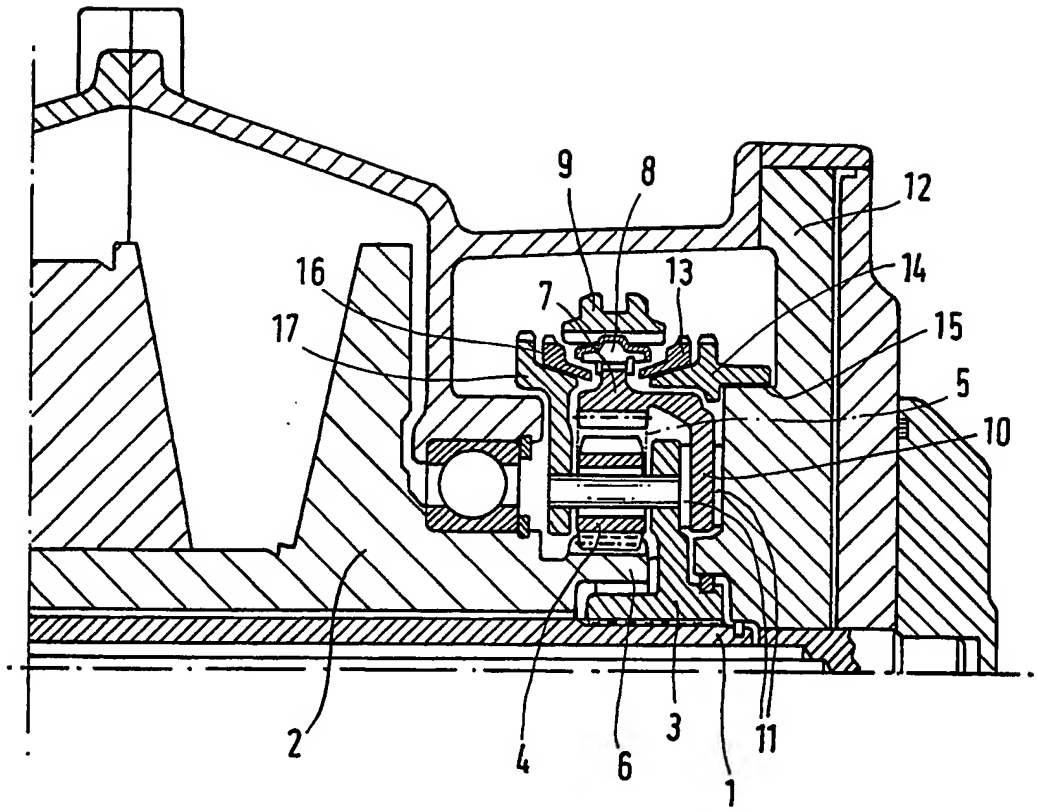

FIG.1

SPECIFICATION

Planetary reversing gear

The invention relates to a planetary reversing gear for an infinitely variable traction-roller gear unit of a motor vehicle. In particular, the invention relates to a planetary reversing gear serving to transmit torque from a drive shaft to the primary shaft of the traction roller gear unit, the primary shaft being a hollow shaft surrounding the drive shaft, the planetary reversing gear comprising a sun wheel, a ring gear serving as a reaction element and a planet-wheel carrier carrying two intermeshing planet wheel sets which also mesh, respectively, with the sun wheel and the ring gear. In such an arrangement, allowing the ring gear to rotate freely will provide a neutral position in which no torque is transmitted. Locking the ring gear to the carrier will result in all the elements rotating in unison to provide a forward gear, while preventing rotation of the ring gear will result in the primary shaft rotating in the opposite direction to the drive shaft, thereby providing a reverse gear.

German Pat. Spec. No. 1630298 describes, in particular in Figure 2, an arrangement of a planetary reversing gear for an infinitely variable traction-roller gear unit of a motor vehicle in which two planet-wheel sets, arranged axially next to one another, are controlled by belt breaks and via servo devices arranged on the periphery. Such a construction is expensive and the cost cannot be reduced even by using the multi-disc clutches shown in Figure 3 of that specification.

German Pat. Spec. No. 2,127,126 discloses a further planetary reversing gear which, because of its use of two planet wheel sets intermeshing with one another has a somewhat shorter axial length but a clutch disc connected to the ring gear has to be actuated by annular pistons which take up considerable space.

The present invention seeks to provide a planetary reversing gear for an infinitely variable traction-roller gear unit for a motor vehicle which enables efficient utilisation of space and has low construction costs.

According to the present invention, there is provided a planetary reversing gear for an infinitely variable traction roller gear unit of a motor vehicle, which reversing gear serves to transmit torque from a drive shaft to the primary shaft of the traction-roller gear unit, the primary shaft being a hollow shaft surrounding the drive shaft, the planetary reversing gear comprising a sun wheel, a ring gear serving as a reaction element and a planet-wheel carrier carrying two intermeshing plane-wheel sets which also mesh, respectively, with the sun wheel and the ring gear, wherein an axially slidable selector ring is coupled for rotation with the ring gear and is operative to interact by way respective synchronising clutches with gears arranged one each side of the ring gear, the latter gears being coupled, respectively, to the planet-wheel carrier and to a stationary housing.

Preferably, the sun wheel is coupled to the primary shaft and acts as an output element while the planet-wheel carrier is coupled to the drive shaft and acts as input element.

The invention, by using synchroniser arrangements which are know per se, enables the construction of a planetary reversing gear of an extremely compact construction which can easily be actuated manually via a selector fork engaging the selector ring. The interposed synchronising clutches prevent jolts which could result from slight rotation movements of the drive shaft and the driven shaft. This is especially advantageous when the infinitely variable traction-roller gear unit is combined with a hydraulic clutch or with a hydrokinetic torque converter.

The invention will now be described further, by way of exampled, with reference to the accompanying drawing which shows a vertical partial longitudinal section through the upper part of the planetary reversing gear of the invention.

In the planetary reversing gear shown in the drawing, a drive shaft 1 is connected, in a manner not shown, to the driving engine of a motor vehicle and a driven shaft 2 is in driving connection with an input element of an infinitely variable traction-roller gear unit which is also not shown.

The drive shaft 1 is coupled for rotation with a planet wheel carrier 3 on which are located two planet-wheel sets 4 and 5 which mesh with one another. One of the sets 4 also meshes with the sun wheel 6 which acts as an output element and is connected to the primary shaft 2. The other set of planet wheels 5, indicated by dot-and-dashed lines in the Figure, additionally meshes with a ring gear 7 which acts a reaction element.

The ring gear 7 acts an input drive gear of a synchroniser arrangement and is coupled, in a known way, by means of a lock 8 for rotation with a toothed selected ring 9. The selector ring 9 is axially displaceable and is provided on its outer surface with a groove engagable by a selector fork.

To prevent axial displacement of the ring gear 7, it is provided with a laterally offset dished portion 10 which is held by means of interposed spacers 11 between the planet wheel carrier 3 and a gear cover 12.

The selector ring 9 interacts on the right hand side, as viewed, via a synchronising conical clutch ring 13 with a gear 14 having a complementary conical surface, the gear 14 being ridgidly mounted on a shoulder 15 of the gear cover 12.

On the left hand side, as viewed, the selector ring 9 can engage by means of a second synchronising clutch cone 16 with a gear 17 formed on the planet wheel carrier 3.

The selector 9, the rings or cones 13 and 16 and the various synchronising conical faces may be designed in a conventional manner and because of the large areas available they can be manufactured from relatively inexpensive materials.

In the position illustrated, the ring gear and the selector ring 9 can rotate freely and thereby provide a neutral position. Upon movement of the selector ring 9 to the left as viewed, the ring gear is prevented from rotation relative to the planet-wheel carrier to provide forward drive, the synchronising cones

acting, in a conventional manner, to provide smooth engagement.

Movement of the selector ring to the right, as viewed, locks the reaction element causing the primary shaft to rotate in the opposite direction to the drive shaft, thereby providing a reverse gear. Again, the synchronising cone 13 serves to provide for smooth engagement, gradually matching the speeds of the meshing toothed elements to one another.

CLAIMS

1. A planetary reversing gear for an infinitely variable traction roller gear unit of a motor vehicle, which reversing gear serves to transmit torque from a drive shaft to the primary shaft of the traction-roller gear unit, the primary shaft being a hollow shaft surrounding the drive shaft, the planetary reversing gear comprising a sun wheel, a ring gear serving as a reaction element and a planet-wheel carrier carrying two intermeshing planet-wheel sets which also mesh, respectively, with the sun wheel and the ring gear, wherein an axially slidable selector ring is coupled for rotation with the ring gear and is operative to interact by way respective synchronising clutches with gears arranged one each side of the ring gear, the latter gears being coupled, respectively, to the planet-wheel carrier and to a stationary housing.

2. A planetary reversing gear as claimed in claim 1, wherein the sun wheel is coupled to the primary shaft and acts as an output element while the planet-wheel carrier is coupled to the drive shaft and acts as input element.

3. A planetary reversing gear constructed substantially as herein described with reference to and as illustrated in the accompanying drawings.

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INVENTOR-INFORMATION:

NAME	COUNTRY
SVAB, EUGEN	DE

ASSIGNEE-INFORMATION:

NAME	COUNTRY
FORD MOTOR CO	GB

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ABSTRACT:

The invention relates to a planetary reversing gear for an infinitely variable traction-roller gear unit of a motor vehicle. The reversing gear serves to transmit torque from a drive shaft 1 to the primary shaft 2 of the traction roller gear unit (not shown). The primary shaft 2 is a hollow shaft surrounding the drive shaft. The planetary reversing gear comprises a sun wheel 6 serving as output element, a ring gear 7 serving as a reaction element and a planet wheel carrier 3 carrying two intermeshing planet-wheel sets 4, 5 which also mesh, respectively, with the sun wheel 3 and the ring gear 7. An axially slidable selector ring 9 is coupled for rotation with the ring gear 7 and is operative to interact by way respective synchronising clutches 13, 16 with gears 14, 17 arranged one each side of the ring gear 7, the gears 14, 17 being coupled, respectively, to a stationary housing 12 and to the planet-wheel carrier 3. <IMAGE>